PHYSIOLOGY

Excretion of Catechol in Human Urine

DURING a study of the catechol compounds in human urine it was observed that acid hydrolysis (20 min., 1 *N* sulphuric acid, 100° C.) caused a large increase in the content of some catechol compounds, presumably by splitting of a conjugate[1]. Chromatographic separation of the different catechols obtained by adsorption on alumina of hydrolysed urine indicated that the large increase was connected with a catechol compound having a rate of flow similar to that of 3,4-dihydroxyphenyl acetic acid in a solvent system of *n*-butanol–hydrochloric acid–acetic acid[2].

Further analysis of the chromatographically separated fractions revealed that the catechol compound differed from 3,4-dihydroxyphenyl acetic acid in its migration pattern in different systems. From its position on paper when butanol–hydrochloric acid and *m*-cresol–acetic acid–water[3] were used as solvents, and by the colour observed on spraying with ferricyanide or ferric chloride, the compound was identified as catechol itself, Fig. 1. This conclusion was further corroborated by colour reactions in solution after addition of ferric chloride, by separation with ion-exchange resins and by fluorescence curves in the spectrophotofluorimeter.

The appearance in urine of a conjugate with sulphuric acid after ingestion of catechol in dogs was shown by Baumann[4] who also claimed that human urine may contain this compound. More recently, Fiker[5] has reported that hydrolysed normal urine contained 5 mgm. catechol per litre.

The amounts of catechol found in five samples of normal human urine after acid hydrolysis varied between 46 and 108 μgm./hr., and was on an average 82 μgm./hr.

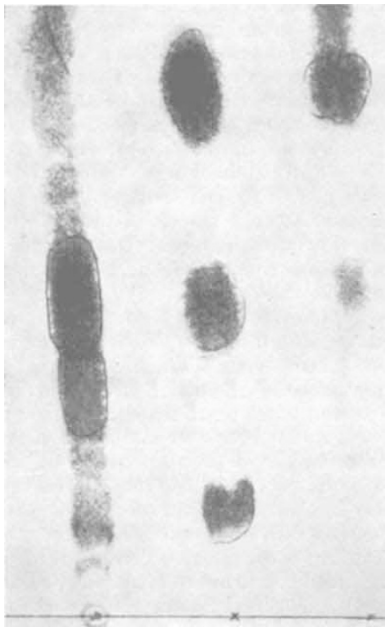

Fig. 1. Paper chromatogram, Whatman No. 1, *m*-cresol–acetic acid–water. (I) Fractions 8·8–13·2 ml. from column chromatogram of unhydrolysed normal human urine, adsorbed on alumina, solvent *n*-butanol–hydrochloric acid–acetic acid–water; (II) standards, catechol, dopac (3,4-dihydroxyphenylacetic acid); doma (3,4-dihydroxymandelic acid); (III) same as I but urine treated with 1 *N* sulphuric acid, 20 min., 100° C. before adsorption. In III about one-fifth of amount of urine in I

No evidence for the presence of catechol in unhydrolysed human urine was obtained. Catechol was also found in cow's urine after hydrolysis.

The origin and formation of the catechol are at present being studied.

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Mechanism of Action of Insulin

EXPERIMENTS have been carried out to determine to what extent insulin lowers the glucose concentration in the plasma by increasing glucose utilization by the tissues and to what extent by diminishing glucose production by the liver.

Trained dogs were used in the post-absorptive state and without anæsthesia. The size of the body glucose pool and the rates of glucose production and utilization in the resting state and during periods of changing blood glucose concentrations were determined by the use of an isotope dilution technique using ^{14}C-glucose[1–3]. The body glucose pool was labelled by a priming injection of a trace amount of uniformly labelled ^{14}C-glucose. The established specific activity was maintained for several hours by a constant infusion of a trace amount of glucose labelled with carbon-14 which balanced the endogenous ^{12}C-glucose output by the liver, provided this output remained constant[1]. After the radioactive glucose had been infused for 2 hr., trypsin-treated crystalline insulin (low in glucagon content; Lilly) was administered in one of the following ways, while the labelled glucose infusion continued uninterrupted: (*a*) single intravenous injection; (*b*) continuous intravenous infusion; (*c*) subcutaneous injection. Samples of blood were collected at intervals and the plasma glucose concentration and specific activity were determined. From these results the glucose production and utilization were calculated[1,3].

It was previously shown[3] by use of this technique that when insulin is administered as a single intravenous injection the resulting hypoglycæmia is due mainly to an increased uptake of glucose by the tissues. The initial transient diminution of glucose release from the liver which was often observed was a relatively minor factor in the development of the hypoglycæmia. The return of the glucose concentration in the plasma to the control value was found to be brought about by a sudden increase in the release of glucose from the liver in response to the hypoglycæmia.

In the present studies insulin was introduced into the jugular vein through a polyethylene tube by means of a constant infusion pump. The insulin dosage varied from 0·1 to 0·25 U./kgm., infused in 90 min. In each case a hypoglycæmia developed which persisted throughout the period of insulin infusion. As shown by the relatively unchanging level of specific activity of plasma glucose the hypo-